

WSDOT RESEARCH REPORT GUIDELINES

by

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Washington State Transportation Commission

Department of Transportation
and in cooperation with

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Contents

Section A—Guideline Summary	A-1
Guideline Summary.....	A-2
Section B—Research Report and Interim Report	B-1
Guidelines for WSDOT Research Reports and Interim Reports	B-2
Example: Research Report and Interim Report.....	B-7
Section C—WSDOT/TransNow Reports.....	C-1
Guidelines for WSDOT/TransNow Reports	C-2
Example: WSDOT/TransNow Report Cover.....	C-3

Section A

Guideline Summary

GUIDELINE SUMMARY

Each research project will require a One-Page Summary and a Research Report. Some projects may require a Technical Report. Consult with the WSDOT Research Office Project Manager assigned to your project before beginning your project to determine the document required. Separate Technical Report guidelines are available

RESEARCH REPORT (OR INTERIM REPORT)

Purpose:	To provide a 35-50 page document. With minor modifications, this report should also be suitable for publication in a journal.
Distribution:	This report will be sent to WSDOT, FHWA, state DOTs, universities, libraries, the National Technical Information Service (NTIS), and other interested researchers.
Requirements:	Section B, pages 3-8
Example:	Section B, pages 9...

Section B

Research Report and Interim Report

GUIDELINES FOR WSDOT RESEARCH REPORTS AND INTERIM REPORTS

This format is intended to provide concise, abbreviated documentation of a project. Readers should be left with a brief history of the problem and the ways in which others have addressed it, an overview of the research approach and procedures used, and a thorough understanding of the findings and their implications

If a project requires more detailed, technical documentation, and thus a larger report, a Technical Report may be necessary. Please consult with the WSDOT Research Office Project Manager assigned to your contract.

The format pertains to both research and interim reports. Every WSDOT project requires a Research Report. Interim reports are sometimes specified in contracts of phased studies or studies that span several years. They document progress, conclusions, or recommendations at a given point in the study.

LENGTH

Both research and interim reports should be no longer than 35 to 50 typewritten, double-spaced pages, including figures and tables, with 1-inch margins on top and bottom and 1 1/4" margins left and right.

STYLE

To achieve uniformity and consistency, use *Webster's Third International Dictionary* for spelling, definition and compounding. Published standards of learned societies are accepted in questions of usage of technical terms. Other matters of style and usage are based on widely accepted style manuals such as the *Chicago Manual of Style* or *Words Into Type*.

PARTS OF THE RESEARCH REPORT

- Title page
- Form 310-022, FHWA Technical Report Standard Title Page (with Abstract)
- Disclaimer
- Table of Contents (including Figures and Tables)
- Body of Report
 - Executive Summary
 - Introduction or Background
 - Review of Previous Work
 - Research Approach/Procedures
 - Findings/Discussion
 - Conclusions
 - Recommendations/Application/Implementation
- Acknowledgment
- References
- Appendices

Title page

The title page should include the title of the report, name(s) of the principal investigator(s), their research agency(ies), name and title of technical contact at WSDOT, type of report, title of project, name of sponsoring agency, and date of publication, using the format shown in the Section D example.

Form 310-022, FHWA Technical Report Standard Title Page

You can obtain this form from the FHWA, WSDOT Research Office, or the TRAC office. The form contains an abstract, which should be self-contained and not require reference to the report to be understood. The abstract should not contain unfamiliar terms, acronyms, abbreviations, symbols, or equations. It should review the primary objectives and scope of the study; the techniques or approaches should be described only to the extent necessary for comprehension; and the findings and conclusions should be presented concisely.

Disclaimer

The disclaimer is to read:

"The contents of this report reflect the views of the author(s), who is (are) responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Washington State Department of Transportation, Federal Highway Administration, or U.S. Department of Transportation [and/or another agency]. This report does not constitute a standard, specification or regulation."

Body of Report

The body of the report should be organized in the following manner:

- Executive Summary
- Introduction or Background
- Review of Previous Work
- Research Approach/Procedures
- Findings/Discussion
- Conclusions
- Recommendations/Application/Implementation

Executive Summary. Write the executive summary with the busy transportation professional in mind. It should be no longer than 10 pages and should be comprehensible apart from the larger document. It should contain a readable yet condensed description, explained within the context of the project scope and objectives, of the research findings, conclusions, and recommendations that evolved from the project. Beyond these elements, it should contain only information that is essential to an understanding of the findings and how they relate to the solution of the operation problems. *Do not summarize the full report.*

Introduction or Background. Discuss the problem that led to the study, current knowledge that can help in its solution, and the objectives and scope of the assigned research.

Review of Previous Work. Summarize or highlight the project's literature review, state-of-the-art survey, or the work that others have performed in relation to the problem at hand.

Research Approach/Procedures. Discuss the approach that was used in attempting to solve the problem. Include in the appendices forms that may have been used in soliciting information or details regarding test procedures or analyses.

Findings/Discussion. Present the research findings that evolved from the project. Include in the appendices summary data, principal mathematical formulas that have been developed, or other technical details.

Conclusions. Conclusions are concerned with general principles suggested in the findings. They are extensions of the findings beyond conditions specific to the project.

Recommendations/Applications/Implementation. Recommendations should address specific actions that WSDOT should consider. Discuss the implications of the findings in relation to standards, specifications, policies, and procedures; what they add to an understanding of the problems; and what effects they have on economy, safety, amenities, and convenience. Assess their limitations. Items recommended for implementation should be identified and necessary implementation steps listed.

References

1. Arrange the reference list alphabetically by author (or publication information if no author); list only the references cited in the text.
2. Denote a reference at the appropriate place in the text (preferably after, rather than interrupting, a sentence) by the author's name and publication date in parentheses. Example: (Reed 1993)

To include a page number, follow the author and date with a comma and the page number. Example: (Reed 1993, 62)
3. Do not reference any material that would not be available to readers in printed form, such as unpublished material, personal communications, telephone conversations, etc. Instead, state these references in parentheses in the text with the term unpublished data.
4. Do not repeat a reference in the list and do not use *ibid.*, *op. cit.*, or *loc. cit.* If a reference is cited more than one time in the text, repeat the author/date citation.
5. Be sure that references are complete. If a reference has no date, include the information "undated."
6. Do not include sources not cited in the text. To include additional sources, create a separate Bibliography list.

Appendices

Appendices should contain (1) materials that are needed to support, explain, or substantiate the main body of the report or (2) discussions whose technical nature would make them inappropriate for or disruptive to the main body of the report. Each appendix should be designated by letter and title, and references to appendices should be made at appropriate places in the text. Numbering appendices by letter (e.g., A-1, A-2, etc.) makes report production easier.

Appendices may contain the following:

- state of the art survey
- manuals and guidelines
- documentation and further elaboration of research findings
- forms
- mathematical analyses
- project statement and project working plan (including any approved revisions)

METRICATION

Current WSDOT rules do *not* require that authors use the International System (SI) units. SI units in parentheses are encouraged. WSDOT recommends ASTM's *Standard Practice for Use of the International System of Units* and AASHTO's *Guide to Metric Conversion* for guidance in converting units from U.S. Customary to SI.

EQUATIONS

1. Current word processing programs allow the display of stacked fractions.
2. Distinguish carefully among the following:
 - all capital and lowercase letters
 - capital O, lowercase o and 0 (zero)
 - lowercase l and number 1 (one)
 - letter X, Greek χ and the multiplication sign \times
 - prime ', apostrophe' and superscript ¹
 - English and Greek letters such as
B and β , n and η , u and μ , p and ρ , and w and ω
3. Number all displayed equations with arabic numerals in parentheses placed flush right, e.g.:

$$\sum 2 + n/\pi \qquad \text{(Equation 1)}$$

FOOTNOTES

Do not use footnotes to the text. Incorporate such notes within the text.

ABBREVIATIONS, ACRONYMS, AND SYMBOLS

Abbreviations, acronyms, and symbols must be fully defined the first time they are used in the paper; the definition should be given first, followed by the abbreviated term in parentheses.

TABLES

1. If tables are not presented on separate pages, leave about 1 1/2" of white space between a table and the text.
2. Number the tables consecutively with arabic numerals and give each table a title. The title should briefly identify the table; furnish background information, describe the results given in the table, or include information provided by column heads in the text, not in the table title.
3. Refer to each table at the appropriate place in the text.
4. Give each column in the table a heading and leave plenty of space around headings.
5. Denote footnotes in tables by superscript letters.
6. Indicate the meaning of a dash (—) when it is used in a table, i.e., whether it is used to indicate missing data, incomplete research, data not applicable or unavailable, or a problem investigated but no results.
7. Check the accuracy of all totals.
8. The size of the type in tables should be no smaller than 10 point.

FIGURES

1. Use professionally drawn graphics and charts that are clean, sharp and black on white. Shades of gray are acceptable. Mimeograph or xerox copies, pencil drawings, blueprints or ozalid prints, and negatives are **not** acceptable. For charts, use plain paper instead of graph paper and show only the main divisions.
2. Use only unscreened, black-and-white glossy prints of photographs that are sharp with good contrast. Slides, color photographs, and negatives are **not** acceptable. (WSDOT does not reprint its reports in color.)
3. If figures are not presented on separate pages, leave about 1 1/2" of white space between a figure and the text.
4. Number figures consecutively with arabic numerals.
5. Refer to each figure by number at the appropriate place in the text.
6. Do not use lettering of figures smaller than 10 point.
7. Figure sizes, line weights, and letter sizes should be uniform throughout the report.
8. Each figure must have a caption.

**Example:
Research Report
and Interim Report**

Research Report

Research Project T9233, Task 9
GIS for Transportation Planning

USING GEOGRAPHIC INFORMATION SYSTEMS FOR REGIONAL TRANSPORTATION PLANNING IN A GROWTH MANAGEMENT CONTEXT

by

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October 1992

TECHNICAL REPORT STANDARD TITLE PAGE

1. REPORT NO. WA-RD 285.1		2. GOVERNMENT ACCESSION NO.		3. RECIPIENT'S CATALOG NO.	
4. TITLE AND SUBTITLE USING GEOGRAPHIC INFORMATION SYSTEMS FOR REGIONAL TRANSPORTATION PLANNING IN A GROWTH MANAGEMENT CONTEXT				5. REPORT DATE October 1992	
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7. AUTHOR(S) Timothy L. Nyerges and James D. Orrell III				8. PERFORMING ORGANIZATION REPORT NO.	
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				11. CONTRACT OR GRANT NO. T9233, Task 9	
12. SPONSORING AGENCY NAME AND ADDRESS Washington State Department of Transportation Transportation Building, KF-01 Olympia, Washington 98504 Doug Brodin, Project Manager, 360-705-7972				13. TYPE OF REPORT AND PERIOD COVERED Research report	
				14. SPONSORING AGENCY CODE	
15. SUPPLEMENTARY NOTES This study was conducted in cooperation with the U.S. Department of Transportation, Federal Highway Administration.					
16. ABSTRACT Growth management in Washington State provides a new context for regional transportation planning. A major part of this planning involves investigation of the latest information processing techniques and interjurisdictional coordination specifically with regard to transportation and land use linkages. Geographic information system (GIS) applications for transportation can assist transportation planners with data analysis concerned with these linkages. This project has identified information needs in the context of a regional transportation planning process, particularly the needs of Regional Transportation Planning Organizations (RTPOs). Urban and rural contexts are considered. Information processing tasks are elucidated and the software functions that address these tasks are presented. Data sources are identified for urban and rural traffic forecast modeling. Institutional and technical barriers inhibiting access to data for the regional transportation planning process are discussed.					
17. KEY WORDS Regional transportation planning, growth management, GIS, information needs, geographic information systems, TIGER/Line, Census Transportation Planning Package			18. DISTRIBUTION STATEMENT No restrictions. This document is available to the public through the National Technical Information Service, Springfield, VA 22616		
19. SECURITY CLASSIF. (of this report) None		20. SECURITY CLASSIF. (of this page) None		21. NO. OF PAGES 50	
				22. PRICE	

DISCLAIMER

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Washington State Transportation Commission, Department of Transportation, or the Federal Highway Administration. This report does not constitute a standard, specification, or regulation.

TABLE OF CONTENTS

<i>Section</i>	<i>Page</i>
Summary.....	vii
Introduction.....	1
Research Objectives	1
The Problem	1
Review of Current Practice.....	3
Literature Review	3
Telephone Survey	5
Procedures.....	6
Workshop 1—Information Needs	6
Individual Listing of Issues.....	6
Clustering Issues to Form Cluster Working Groups	6
Issues and Regional Transportation Planning Components	8
Issues and Scales of Analysis.....	9
Issues and Information Processing Applications	9
Workshop 2—The Regional Transportation Planning Process	9
Findings/Discussion	18
Synthesis of Workshop 1 Results	18
Institutional Issues	18
Technical Issues.....	19
Synthesis of Workshop 2 Results	19
A Database Model for Regional Transportation Planning.....	25
Conclusions	ix
Recommendations/Application/Implementation	37
Important Aspects of this Research for Individual RTPOs	37
Important Aspects of this Research for the Overall Problem.....	37
Acknowledgments.....	41
References	42

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1. Workshop 1 Process Overview.....	7
2. Association of Transportation Planning Scales of Analysis with Administrative and Geographic Perspectives for Regional Transportation Plan Development.....	12
3. Regional Transportation Plan Making Process.....	15
4. Regional Transportation System Analysis	16
5a. Database Model for Travel Directed at Developing Trip Distributions.....	26
5b. Database Model for Travel Directed at Loading Trip Assignments onto Transport Network and Performing System Evaluation.....	27

LIST OF TABLES

<u>Table</u>	<u>Page</u>
1. Synthesis of Issues From Information Needs Workshop.....	20
2. Tasks by Plan Component.....	21
3. Data Categories and Data Sources	29
4a. Data Entry Functions in a GIS for Transportation.....	33
4b. Data Output/Display in a GIS for Transportation.....	33
4c. Data Management in a GIS for Transportation.....	34
4d. Data Manipulation Functions in a GIS for Transportation.....	35
4e. Data Analysis Functions in a GIS for Transportation.....	36
5. Data Issues Impeding Regional Transportation Planning	39

EXECUTIVE SUMMARY

This report documents tasks 1 and 2 of a three-part research project investigating the use of geographic information processing technology to support regional transportation planning. The Washington State Department of Transportation (WSDOT) recognizes that the emergence of a new mandate for regional transportation planning under the Washington State Growth Management Program provides a new context for the planning process. They also recognize that the use of geographic information processing technology can facilitate regional transportation plan development.

The findings documented in this report, in large part, result from two highly interactive workshops designed and implemented by the research team. Workshop participants included transportation planning professionals from the organizations responsible for plan development, as well as from other organizations representing important roles in support of transportation planning, including those offering information sources, e.g., the Census Bureau. The workshops were designed, in part, to encourage intergovernmental coordination and cooperation as mandated in the growth management program.

The purpose of the first workshop was to identify, and begin the synthesis of, the broad range of information needs for regional transportation plan development. The methodology developed for the workshop and documented in this report may be of concern to other information gathering sources interested in geographic information system (GIS) implementation. The second workshop involved a more detailed examination of the information needs, data sources, and software functions necessary for regional transportation plan development.

This report further synthesizes the results from the workshops with other issues of concern in the implementation of geographic information processing technology in regional transportation planning. Specifically, the regional transportation planning process is...

INTRODUCTION

RESEARCH OBJECTIVES

The first objective of this part of the research project was to identify the informational needs of the regional transportation planning process. Information needs were developed from two one-day workshops, a literature review, a telephone survey, and a synthesis of the requirements outlined in the Growth Management Legislation.

The second objective of this research was to analyze and evaluate how the forthcoming Census Transportation Planning Package (CTPP) and TIGER/line data could support the transportation planning needs identified for the first objective. The report documents a wide range of the data and sources necessary for regional transportation planning and provides a first step of identifying specific problems associated with their acquisition and implementation.

THE PROBLEM

This report documents the regional transportation planning process as mandated by the Growth Management Program created by the Washington State Legislature in 1990. It begins with a description of the planning problem and the required components for plan development. This description includes different perspectives on the regional planning problem, but ultimately recognizes that the process and information needs are similar for all jurisdictions involved in planning. The issue of scales of analysis is seen as the unifying dimension for the different institutional perspectives on the planning process.

Following this description, more detailed discussions of information processing tasks, information categories, and data sources are outlined. This effort focuses on the presentation of a single database model, which captures the essence of data requirements and data relationships, to support the planning process regardless of the geographic scale of analysis....

REVIEW OF CURRENT PRACTICE

LITERATURE REVIEW

Over the past several years, transportation modeling has been a large part of the planning effort of MPOs in Washington State. The Growth Management Program requires that RTPOs develop regional transportation plans and that these plans be consistent with the transportation elements of local comprehensive plans. This requirement will increase the level of effort expended on land use based travel demand modeling, which is part of the data analysis used in preparing regional transportation plans. In addition, the plan consistency required by the Growth Management Program necessitates an enhanced level of inter-jurisdictional coordination among MPOs, RTPOs, District Planning Offices, and local agencies.

During the 1980s part of the transportation planning efforts by MPOs across the U. S. was supported by the Urban Transportation Planning Package (UTPP), published by the Census Bureau. The UTPP was a special product of the 1980 Census organized for transportation planning applications. It contained population, employment, and supportive journey-to-work data. In an effort to continue support for such planning applications, the Census Bureau, in cooperation with the Federal Highway Administration (FHWA), will soon be releasing another Census Transportation Planning Package (CTPP). This refined set of journey-to-work transportation data is a special product of the 1990 Census. The CTPP will be compatible with the previously released TIGER/line street network files since the TIGER/line files provide the geographic reference elements for the CTPP. CTPP includes the following types of data: place of work, commuter trip (including both ends of trip), and place of residence. There is a statewide component consisting of place, county, and state level data, and an urban component consisting of transportation analysis zone, and census tract data....

PROCEDURES

This section reviews the approaches and results from two one-day workshops designed and implemented by the project team. The workshop participants represented a broad cross-section of organizations responsible for the development of regional transportation plans.

WORKSHOP 1 INFORMATION NEEDS

The purpose of the first workshop was to begin the process of identifying the issues associated with implementing transportation planning under growth management. A graphic outline of the workshop process displays an overview of the process (see Figure 1). The work sessions identified in the figure are described in this section.

Individual Listing of Issues

The workshop began with each of the participants reviewing a list of issues compiled from returned questionnaires. The participants were then asked to consider this list and any other additional issues, and to identify the three issues of greatest significance to them. These three issues were then listed on separate 5" x 8" index cards along with the initials of the participant.

Clustering Issues to Form Working Group Themes

Related issues were clustered together to form subjects for discussion. Each participant forwarded the card stating their most significant issue first. This grouping activity was repeated two more times, thus addressing each of the three issues chosen by each participant. When participants had more than three highly-significant issues, their additional cards were considered one at a time for association with any of the existing working group themes.

A check was then made to insure that each working group represented at least two different issues, and that no one issue was represented in more than one working group in a given round. This was done because it spurred conversation for sharing information....

FINDINGS/DISCUSSION

SYNTHESIS OF WORKSHOP 1 RESULTS

The issues identified in the first workshop were divided into two categories: institutional and technical concerns. As the first step in our synthesis, we combined the issues identified in the first workshop into a single database and resorted them based on their primary concerns' emphasis—institutional or technical.

Institutional Issues

Several institutional concerns were identified:

- Guidelines (roles, data, analysis),
- Identification of roles, responsibilities, cooperation (of key players and agencies),
- Criteria (data, planning, analysis),
- Standardization of LOS/Technical criteria,
- Consistency of regional transportation plans,
- Unifying multiple agency priorities,
- Staffing,
- Elected official involvement,
- Information dissemination, and
- Sources of, access to, and timeliness of data.

The above list indicates that a significant number of the issues identified in the first workshop were associated with institutional concerns. Clearly, two things were requested by workshop participants: 1) further policy-level clarification of the growth management program's transportation provisions, and 2) development of appropriate institutional guidelines. It is not in the scope of this project to develop such guidelines, but it is of interest to the WSDOT Transportation Planning Office in their ongoing efforts to provide transportation planning, a growth management program, and technical assistance to WSDOT districts, locales, and the RTPOs.

One of the institutional concerns identified in the workshop is the **issue of information sources, access, and dissemination**. This is a key consideration of this research project. The development of a prototype information processing application to partially support this activity (a GIS application for monitoring transportation planning ...

CONCLUSIONS

This report presents a broad framework, which captures the interplay between the regional transportation planning process and information processing technology. The breadth and depth of the material presented should provide valuable insights for those interested in both policy and technical aspects of the regional transportation planning process. This project is the first step in undertaking the information technology transfer problem for transportation analysis in growth management. We believe that further detailed issues regarding information processing can easily follow the basic structure set forth in this report.

This research has benefited from the contributions of many individuals in the regional transportation planning community. Their open interaction in the workshops has added greatly to the clarification of regional transportation planning problems. As the planning process moves forward, there is a need for this type of exchange to continue between RTPOs and individual planners.

The synthesis of the workshops' results presents several important conclusions. The first is that the regional transportation planning effort needs further policy-level guidance if it is going to meet the goals of the growth management program. This is, however, an institutional problem, and not the primary focus of this research.

The second issue that needs more deliberation concerns data access and better coordination of data sharing. This report documents data needs and has begun the data source identification process. It notes specific cases where data exist but are currently inaccessible to the planning community because of institutional barriers. A coordinated and cooperative effort to overcome unnecessary obstructions to data sharing should be further pursued.

Third, and last, it has become apparent from this research that many of the RTPOs need greater technical support to implement the technical solutions identified here. Further

RECOMMENDATIONS/APPLICATION/IMPLEMENTATION

From a technological standpoint, the results of this research provide a starting point for considering how the tasks of regional transportation planning under growth management intersect with current geographic information processing concepts and techniques. The issues identified demonstrate concerns regarding data sources and availability, and concerns regarding software capability. Currently, the knowledge base in both areas seems to be lacking or dispersed, based on the cross-section of input received from the workshop participants. This report's aim is to resolve this problem.

IMPORTANT ASPECTS OF THIS RESEARCH FOR INDIVIDUAL RTPO'S

From a management standpoint, the process diagrams (figures 3 and 4) and task list (Table 2) developed in this report are applicable to a broad range of organizations, enabling them to better understand the nature of regional transportation planning problems and how geographic information processing technology can be applied. This information provides a starting point for the development of more detailed plans and programs to meet the needs of various organizations in the state of Washington.

Additionally, the general GIS functions described in tables 4a-4e can be used to identify the important software functions available in some software to address specific transportation planning problems. However, each MPO and RTPO must assess these functions considering its own technological needs. In general, the value of this research in addressing these types of issues is primarily at the level of individual RTPO/MPOs.

IMPORTANT ASPECTS OF THIS RESEARCH FOR THE OVERALL PROBLEM

This research can make an important contribution at the intergovernmental level. It is at this level that further application and implementation of the concepts developed in this report could have the greatest effect on the regional transportation planning effort and the adoption of geographic information processing technology to support this effort....

ACKNOWLEDGMENTS

The authors express their appreciation to the personnel of the many metropolitan transportation planning organizations throughout the U.S. who provided information for this study. Special thanks go to the personnel of the Regional Transportation Planning Organizations throughout Washington State who contributed their time during the workshops, making this study a creative undertaking. The authors would like to recognize the contributions of Elaine Murakami, Larry Blain, Garr Clark, and Glenn Miles for comments provided during the design and documentation of the workshop results. Last, but not least, the authors wish to thank Judith Lorenzo of the WSDOT Design Office (formerly with the Planning Office), as technical monitor, for allowing us the creative leash to draw these ideas together.

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Section C

WSDOT/TransNow Reports

GUIDELINES FOR WSDOT/TRANSNOW REPORTS

When WSDOT and Transportation Northwest (TransNow) jointly fund a project, the resulting reports will have a few differences.

Except for the differences noted below, the reports should follow all other WSDOT report guidelines.

ONE-PAGE SUMMARIES

- No differences.

RESEARCH REPORTS AND INTERIM REPORTS

- Use the WSDOT/TransNow cover layout.
- Use the WSDOT/TransNow disclaimer (see below).

WSDOT/TRANSNOW DISCLAIMER

The disclaimer is to read:

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Example:
WSDOT/TransNow Report Cover

Research Report

Research Project GC8719, Task 9
Motorist Information Real-Time

REAL-TIME MOTORIST INFORMATION FOR REDUCING URBAN FREEWAY CONGESTION: COMMUTER BEHAVIOR, DATA CONVERSION AND DISPLAY, AND TRANSPORTATION POLICY

	by	
Mark Haselkorn	Woodrow Barfield	Jan Spyridakis
Principal Investigator	Co-principal Investigator	Investigator

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